

CLAIMS

1. A male self-riveting fastener element, comprising:
a shank portion and an integral tubular barrel portion having a substantially constant cross-section including a generally cylindrical outer surface, a
5 cylindrical inner surface, and an open distal end coaxially aligned with said shank portion, wherein said tubular barrel portion has an axial length equal to or less than sixty percent of an outer diameter of said generally cylindrical outer surface of said tubular barrel portion.
- 10 2. The male self-riveting fastener element as defined in Claim 1, wherein said fastener element is formed of a high strength carbon steel having a hardness greater than the 30 Rockwell on the C scale.
- 15 3. The male self-riveting fastener element as defined in Claim 1, wherein said male self-riveting fastener element includes a radial flange portion integral with said tubular barrel portion including a diameter greater than said tubular barrel portion having a generally cylindrical outer surface including a plurality of equally circumferentially spaced radial teeth.
- 20 4. The male self-riveting fastener element as defined in Claim 3, wherein each of said equally circumferentially spaced radial teeth include a generally radial planar surface extending generally perpendicular to a circumference of said outer surface of said radial flange portion.

5. A self-riveting male fastener element, comprising:

a shank portion, an integral radial flange portion having a diameter greater than said shank portion including an outer surface, and a tubular barrel portion integral with said radial flange portion and coaxially aligned with said shank portion,
5 said tubular barrel portion having an axial length equal to or less than sixty percent of an outer diameter of said outer surface of said tubular barrel portion and said male fastener element formed of carbon steel having a hardness greater than 30 Rockwell on the C scale.

10 6. The self-riveting male fastener element as defined in Claim 5, wherein said outer surface of said radial flange portion includes a plurality of circumferentially spaced radial teeth.

7. The self-riveting male fastener element as defined in Claim 6, wherein
15 each of said circumferentially spaced radial teeth include a generally radially extending planar surface extending generally perpendicular to a circumference of said outer surface of said radial flange portion.

8. A self-riveting male fastener and metal panel assembly, comprising:

a self-riveting male fastener formed of carbon steel having a hardness of at least 30 Rockwell on the C scale including a shank portion, a flange portion integral with said shank portion having a diameter greater than said shank portion having an outer surface, and a barrel portion coaxially aligned with said shank portion, said barrel portion including a tubular barrel portion integral with said flange portion and a generally radially outwardly extending distal end portion spaced from said flange portion; and

a metal panel including a planar portion surrounding said outer surface of said flange portion, and an L-shaped portion integral with said planar portion including a portion integral with said planar portion extending generally perpendicular to said planar portion deformed into said outer surface of said flange portion in substantially face to face contact therewith and a radially inwardly directed portion deformed between said flange portion and said generally radially outwardly extending distal end portion of said barrel portion.

9. The male fastener and metal panel assembly as defined in Claim 8, wherein an overall length of said barrel portion, including said tubular portion and said generally radially outwardly extending distal end portion is equal to or less than sixty percent of an outer diameter of said tubular portion of said barrel portion.

10. The male fastener and metal panel assembly as defined in Claim 8, wherein said generally radially outwardly extending distal end portion of said barrel portion has a width equal to about one half or less than a width of said planar portion of said panel.

11. The male fastener and metal panel assembly as defined in Claim 8, wherein said generally radially outwardly extending distal end portion of said barrel portion extends generally parallel to said planar portion of said metal panel and is generally rectangular in cross-section.

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12. The male fastener and metal panel assembly as defined in Claim 8, wherein said outer surface of said radial flange portion includes a plurality of circumferentially spaced generally radial teeth each having a generally cylindrical outer surface and said inner surface of said L-shaped portion of said panel is deformed
10 against said generally cylindrical outer surface and between said circumferentially spaced generally radial teeth preventing rotation of said male fastener in said metal panel.

13. The male fastener and metal panel assembly as defined in Claim 12,
15 wherein each of said plurality of circumferentially spaced radial teeth include a planar generally radial surface extending generally perpendicular to a circumference of said outer surface of said radial flange.

14. The male fastener and metal panel assembly as defined in Claim 8,
20 wherein said barrel portion has a bottom wall at said radial flange portion and a substantially continuous convex arcuate surface extending from said bottom wall to a distal end of said generally radially extending distal end portion.

15. A male fastener and panel assembly, comprising:

a carbon steel male fastener having a shank portion, a flange portion integral with said shank portion having a diameter greater than said shank portion including a generally cylindrical outer surface, and a barrel portion coaxially aligned
5 with said shank portion including a tubular portion integral with said flange portion and a generally radially outwardly extending distal end portion spaced from said flanged portion, said barrel portion having an overall length including said tubular portion and said generally radially outwardly extending distal end portion equal to or less than sixty percent of an outer diameter of said tubular portion; and

10 a metal panel including a planar portion surrounding said outer surface of said flange portion, and an L-shaped portion including a first portion integral with said planar portion extending generally perpendicular to said planar portion having an inner surface deformed against an outer surface of said flange portion in substantially face to face contact, and a second generally radially inwardly extending distal end
15 portion having an opening therethrough receiving said tubular portion of said barrel portion deformed between said flange portion and said generally radially outwardly extending distal end portion of said barrel portion.

16. The male fastener and panel assembly as defined in Claim 15, wherein
20 said male fastener is formed of a carbon steel having a hardness of at least 30 Rockwell on a C scale.

17. The male fastener and panel assembly as defined in Claim 15, wherein
said second generally radially inwardly extending distal end portion of said panel has
25 a width of about one half or less than a width of said planar portion of said panel.

18. The male fastener and metal panel assembly as defined in Claim 15, wherein said second generally radially inwardly extending distal end portion of said panel is generally parallel to said planar portion and has a generally rectangular cross-section.

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19. The male fastener and metal panel assembly as defined in Claim 15, wherein said outer surface of said flange portion includes a plurality of circumferentially spaced radial teeth and said inner surface of said panel is deformed between said circumferentially spaced radial teeth, preventing rotation of said male
10 fastener relative to said panel.

20. The male fastener and metal panel assembly as defined in Claim 18, wherein each of said radial teeth include a planar generally radially extending surface generally perpendicular to a circumference of said outer surface of said flange
15 portion.

21. The male fastener and metal panel assembly as defined in Claim 15, wherein said barrel portion has a bottom wall at said radial flange portion and a substantially continuous convex arcuate surface extending from said bottom wall to a
20 distal end of said generally radially outwardly extending distal end portion.